

REMARKS

The Examiners, Messrs. Mills and Utech, are thanked for the courtesy extended applicants' representatives during the interview conducted on July 20, 2001, in connection with the above-identified application and the copending related application Serial No. 09/421,044.

In light of the interview, applicants have considered it best to cancel claims 13-20, and have presented new claims 21-30, the independent claims corresponding to the claims having been discussed at the interview.

Also, as discussed at the interview, submitted herewith are complete copies of the Japanese documents submitted by the Information Disclosure Statement of July 9, 2001 in the copending application, noting that English language abstracts accompanied the Information Disclosure Statement and copies of these documents are also enclosed. Also, submitted herewith is a copy of European Patent Application No. 0 648 858 A1, which applicants consider to correspond to Japanese Patent Application Laid-Open No. 7-312363, as described at page 5, line 15 to page 6, line 21 of the specification of this application.

At the outset, it is noted that the present invention, as now claimed in this application, is directed to a plasma etching apparatus in which a sample is to be etched and differs from a method and apparatus in which a sample has a

coating film deposited thereto, such as in a CVD apparatus and method. As described in the specification of this application, not only is the sample which is held within a reaction chamber etched, but also the sidewalls of the etching chamber undergo etching to some degree, resulting in a reduction in useful life of the etching chamber. Furthermore, as described in the plasma etching process, the temperatures of the inner wall of the reactor and the sample and the deposition status of reaction products on the inner wall of the reaction chamber greatly affect the process, whereby if reaction products deposited inside the reaction chamber are peeled off from the wall thereof, dust may be caused, resulting in deterioration of the characteristics of the sample and reduction of the yield. In accordance with the present invention, as illustrated in Fig. 1 of the drawings, for example, an exchangeable jacket 103 is held inside of the sidewall of an etching chamber so as to form a wall surface of the etching chamber. In accordance with the present invention, a heat exchanging medium, such as a refrigerant, as described in the specification of this application, is circulated through the interior of the exchangeable jacket during etching so as to control a temperature of the surface of the jacket which faces the plasma in the etching chamber during etching of the sample within a predetermined range. While the specification of this application describes a range

of temperatures of 0°C to 100°C and other temperatures within such range, as described at page 23, lines 24-27, if the sidewall temperature is particularly controlled within a range from normal temperature to about 50°C, such range is particularly effective. More particularly, by controlling the temperature of the sidewall or the surface of the jacket facing the plasma, a coating layer is deposited on the surface of the exchangeable jacket facing the plasma during etching of the sample, which prevents the surface of the exchangeable jacket from being etched by the plasma during etching of the sample. As described in the specification, by depositing such film, and controlling the temperature of the surface of the exchangeable jacket by circulating the refrigerant through the interior of the exchangeable jacket, internal stress caused by a temperature change is not generated during deposition of the film and the film structure becomes fine. As described at page 23, lines 1-8 of the specification, a solid layer structure is formed which film is very fine and strong and even when a film is deposited tentatively up to a thickness of about 200 microns, peeling of the film is not observed with this film being highly resistant to plasma and it is acknowledged that peeling and damage of the film surface are not observed even by the processing of plasma and no dust is caused. Thus, as described at page 23, lines 14-24 of the specification, the film is highly resistant to plasma and

peeling of reaction products and adhesion of particles onto the sample surface are reduced so that it acts as a protection film for the inner wall of the reactor. Therefore, the sidewall is free of consumption and damage, so that the exchange frequency of parts of the sidewall can be reduced and the reduction of running cost results. Furthermore, since the sidewall is protected by the deposit film, there is no need to use ceramic such as SiC, which is highly resistant to plasma and the cost of parts can be reduced. As is apparent, the recited features as now set forth in the claims of this application provide advantages which are not disclosed or taught in the cited art, such that applicants submit that the newly presented claims should be considered allowable, as will be discussed below.

The rejection of claims 13-20 under 35 U.S.C. §103(a) as being unpatentable over Redeker et al, U.S. Patent 5,800,621 in view of Shang et al, U.S. Patent 6,055,927 is traversed insofar as it is applicable to the present claims, and reconsideration and withdrawal of the rejection are respectfully requested.

In setting forth the rejection, the Examiner notes that Redeker et al does not expressly disclose a jacket held inside the sidewall in an exchangeable state having a temperature controller for controlling the temperature by circulation of a heat exchange medium. The Examiner contends that Shang et al

shows a plasma processing apparatus in which the wall 70 of the chamber 10 are heated by using a heated gas or liquid, such as water, from a recirculating fluid supply 61. The Examiner indicates that in view of these disclosures, it would have been an obvious choice of design to one having skilled in the art at the time the invention was made to modify the apparatus of Redeker et al as to comprise a heating medium means for heating the chamber walls because such means is conventional in the art and because the method by which the walls are heated is not critical as taught by Shang et al. As to the temperature controller, the Examiner contends that it would have been obvious to one having ordinary skill in the art at the time the invention was made that the apparatus of Shang et al comprises a temperature controller and in the alternative, the Examiner takes Official Notice that temperature control means are well known. As to specific claimed temperatures, the Examiner contends that such limitation is directed to a method limitation instead an apparatus limitation.

The Examiner is referred to the decision of In re Fine, 5 USPQ 2d 1596 (Fed. Cir. 1988), wherein the court pointed out that the PTO has the burden under §103 to establish a prima facie case of obviousness and can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the

art would lead that individual to combine the relevant teachings of the references. As noted by the court, whether a particular combination might be "obvious to try" is not a legitimate test of patentability and obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination. As further noted by the court, one cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention.

Applicants note that all claims of this application recite a plasma etching apparatus and both Redeker et al and Shang et al are directed to an apparatus wherein some type of film is deposited on a sample. Thus, these disclosures are directed to deposition apparatus rather than etching apparatus, as claimed, and do not disclose or teach etching chambers and other features as recited in the claims of this application. Moreover, each of the independent claims 21 and 26 recite an exchangeable jacket with claim 21 reciting an etching chamber having a sidewall and an exchangeable jacket which is held inside of said sidewall so as to form a wall surface of the etching chamber with the sample being disposed in the etching chamber. Claim 26 recites the feature of an exchangeable jacket for protecting the sidewall of the etching chamber and other features, as will be discussed below.

With respect to claim 21, such claim recites a temperature controller which circulates a heat exchanging medium through the interior of said exchangeable jacket during etching so as to at least control a temperature of the surface of said jacket which faces the plasma in said etching chamber within a predetermined range and enables depositing of a coating layer on the surface of said exchangeable jacket during etching which prevents the surface of said exchangeable jacket from being etched by said plasma. Turning to Redeker et al, as noted above, such patent is directed to a deposition apparatus and not an etching apparatus and this patent does not disclose an exchangeable jacket held inside of the sidewall so as to form a wall surface of the etching chamber nor a temperature controller which circulates a heat exchanging medium through the interior of the exchangeable jacket during etching. Likewise, Shang et al is directed to a deposition apparatus and not an etching apparatus, as claimed, and while this patent discloses a liner 15 which is generally in physical and thermal contact with the interior walls of the chamber 10, there is no disclosure or teaching that the liner 15, if considered to be an exchangeable jacket, cooperates with a temperature controller which circulates a heat exchanging medium through the interior of the exchangeable jacket during etching. Whether or not such a heat exchanging medium is circulated through walls of the chamber, it is

readily apparent that there is no disclosure or teaching of the claimed features as set forth in claim 21 and the dependent claims thereof. Additionally, there is no disclosure or teaching that the control of the temperature of the surface of the jacket which faces the plasma in the etching chamber within a predetermined range in the manner defined enables depositing of a coating layer on the surface of the exchangeable jacket during etching, which prevents the surface of the exchangeable jacket from being etched by the plasma. With respect to independent claim 26 which recites features in a means plus function format, such claim recites means for preventing etching of the surface of the exchangeable jacket which is held inside of the sidewall of the etching chamber and faces the plasma during etching of the sample by depositing a coating film on the surface of the exchangeable jacket during etching of the sample. Again, the cited art of Redeker et al and Shang et al do not disclose a plasma etching apparatus as recited in claim 26 nor disclose any means performing the function as defined. Thus, it is apparent that independent claims 21 and 26 and the dependent claims thereof patentably distinguish over this proposed combination of references in the sense of 35 U.S.C. §103, and should be considered allowable thereover.

With respect to the dependent claims, it is noted that such claims recite further features of the present invention,

and when considered in conjunction with the parent claims also patentably distinguish over the cited art, such that these claims should also be considered allowable at this time.

As discussed at the interview, although the Collins et al patent (U.S. 6,068,784) has been utilized in rejecting claims of the copending application, Collins et al does not disclose an exchangeable jacket, circulating a heat exchanging medium through the interior of the exchangeable jacket during etching so as to at least control a temperature of the surface of the exchangeable jacket which faces the plasma in the etching chamber within a predetermined range. Additionally, Collins et al does not disclose depositing of a coating layer on the surface of exchangeable jacket which prevents the surface of the exchangeable jacket from being etched by the plasma. Thus, it is apparent that all claims, as presented herein, patentably distinguish over Collins et al.

With respect to the other documents referred to at the interview, applicants consider, the EPA document which provides an English language document corresponding to the Japanese Laid-Open Patent Application described in the specification to be pertinent to the present invention. More particularly, referring to the abstract of the EPA document, gaseous materials which are capable of forming a polymeric coating upon exposure to a plasma are used to generate films of polymeric coating (122) which trap particulate contaminants

against the etch chamber walls (113), making these contaminants unavailable to contaminate the workpiece surface. As described in this document at page 5, lines 48-58, the coating 122 covers and entraps particulate contaminants deposited on inner walls 113 of the chamber housing 114. Furthermore, as described, it is preferable that an initial coating, i.e. prior to the commencement of any plasma etch processing, be deposited on the inner surfaces of the etch chamber so as to protect the wall itself from the corrosive effect of both etching gases and particular contaminants. It is noted, however, that the disclosure of this document is to provide a coating 122 for entrapping particulate contaminants so as to prevent contamination of the workpiece, and there is no disclosure or teaching in this document of depositing the coating during etching of the sample for protecting the inner walls of the chamber. As described in this document, the chamber wall temperature is maintained at a temperature 5°C less than the operational workpiece temperature and the examples at page 8 of the document describe the chamber wall temperature as being maintained at 65°C and 80°C. Moreover, examples 1 to 3 at page 8, describe the formation of a coating layer of 0.2 micrometers. Thus, this document does not disclose or teach the provision of an exchangeable jacket, circulation of a heat exchange medium through the interior of the jacket for controlling the temperature of the surface of

the jacket which faces the plasma during etching, nor the depositing of a coating layer on the surface of the exchangeable jacket facing the plasma during etching of the sample, which prevents the surface of the exchangeable jacket from being etched by the plasma during etching of the sample. Additionally, this document does not disclose controlling the temperature of the surface of the exchangeable jacket in a range of 0 to 50°C nor that the coating layer is deposited up to a maximum thickness of 200 microns, as recited in the claims of this application. As such, applicants submit that all claims patentably distinguish over this document.

With regard to the other documents discussed at the interview, applicants note that JP 9-157832 is directed to a deposition processing apparatus and not an etching apparatus and provides a deposition preventive plate 1 mounted on the inner wall of the vacuum device used for deposition processing. As indicated therein, a heating medium pipe 2 and a cooling medium pipe 3 are provided on the surface of the plate 1 for heating and/or cooling of the plate 1. Thus, it is apparent that the medium, whether heating or cooling medium, is not circulated through an exchangeable jacket as disclosed and claimed herein. Furthermore, it is apparent that this document does not relate to an etching apparatus or etching processing and does not disclose or teach the depositing of a coating layer on a surface of an exchangeable

jacket during etching of the sample so as to prevent the surface of the exchangeable jacket from being etched by the plasma during etching of the sample. Also, this document does not disclose other features as set forth in the claims of this application. Accordingly, applicants submit that all claims patentably distinguish over this document.

As to JP 9-275092 discussed at the interview, it is noted that while this document relates to a plasma etcher, this document discloses a protective wall member 12 is attached exchangeably through a specified space along the inner wall of the chamber 1 so as to facilitate cleaning work and that plasma processing is stabilized by introducing a gas into the space between the chamber wall and the protective wall member so as to suppress a temperature rise at the surface of the protective wall member. Although as discussed at the interview, gas is not considered to be a heat exchanging medium, it is apparent that the gas is not circulated through an interior of the protective wall member of such document and there is no disclosure or teaching of depositing a coating layer to prevent etching of the protective wall member during etching of a sample in the manner disclosed and claimed in this application. As such, applicants submit that all claims patentably distinguish over this document.

With regard to JP 62-218570 discussed at the interview, it is noted that this document is directed to a CVD apparatus

and not an etching apparatus, and discloses a cassette 32, as illustrated in Fig. 7 having a cooling gas filled therein. Such cassette apparently serves for preventing a deposition film which is to be deposited on the sample from being deposited on the wall of the chamber in that as described in the English language abstract forwarded with the Information Disclosure Statement on July 9, 2001, the deposited film is formed on the surface of the base body 2 and at the same time, the bi-product sticks on the inside surface of the cassette and therefore, the bi-product is removed extremely easily the reaction chamber simply by taking out the cassette after the operation. Hereagain, while the cassette may be considered an exchangeable jacket, it is readily apparent that this document is not related to an etching apparatus or etching processing and does not disclose circulating of a heat exchanging medium through the interior of an exchangeable jacket so as to control the temperature of a surface of the jacket facing the plasma during etching nor is there is disclosure of depositing a coating layer during etching of the sample, which prevents etching of the surface of the jacket. Additionally, this document does not disclose the other features as disclosed and claimed herein, such that all claims patentably distinguish over this document.

Insofar as the Examiners, at the interview, suggested that the various documents cited may be combined to provide

the claimed features, applicants note that such combination can only come about by a hindsight reconstruction attempt utilizing the principle of "obvious to try" which is not the standard of 35 U.S.C. §103. See In re Fine, supra.

In view of the above amendments and remarks, applicants request favorable consideration of all claims present in this application.

To the extent necessary, applicant's petition for an extension of time under 37 CFR 1.136. Please charge any shortage in the fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 01-2135 (503.34403CV4) and please credit any excess fees to such deposit account.

Respectfully submitted,



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